XL500 Ultra2 SCSI
Storage Array
User's Guide

P/N: MAN-XL500UG-001

Revision: A1

March 1999

Scope

This manual describes the installation and configuration of the XL500 Ultra2 SCSI Storage Array. Both the Single Tower and datacentre Rackmount versions are described

WARNING: Only trained service personnel should perform changes to this unit.

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Chapter 1: Introduction

The Ultra 2 SCSI standard offers data throughput of 80 MB/s, connectivity of up to sixteen devices (including host systems) and is backward compatible with earlier SCSI peripherals. The Ultra 2 SCSI standard offers bus lengths of 12 meters (or 25 meters in a two device point-to-point configuration). This is a significant improvement over current Ultra 1 SCSI Single Ended restrictions of 1.5 meters for greater than 4 devices or 3 meters for 4 devices or less.

Ultra 2 SCSI has the ability to connect multiple classes of peripherals such as Tape Libraries, Scanners, Printers, Disk Drives, etc.

Environmental monitoring is provided by the use of Eurologic's Versatile Environmental Monitor (VEM) which gives feedback on irregularities such as over temperature conditions or impending component failure. When used in conjunction with Eurologic's Vision™ Software it provides immediate response via a variety of mechanisms such as email, Syslog, and script file activation. The Versatile Environmental Monitor (VEM) supports both SES and SAF-TE protocols.

Features of XL500 Ultra2 SCSI Storage Array

The main features of the XL500 Ultra2 SCSI Storage Array are:

- 10 Meter external cable length.
- 80 MB/s transfer rate.
- Wide SCSI addressing (16 devices including hosts, VEM and disk drives).
- Backward compatible with earlier Ultra SCSI and wide SCSI 2 devices[1].
- Backplane supports up to 7 disk drives.
- Modular, expandable system.
- Rackmountable.
- Vision Data Management Software.
- Passive LVD backplane for unprecedented reliability.
- Support for the latest (10K) and next generation drives.
- Cableless design.
- Versatile Environmental Monitor (VEM) monitors system conditions and all active components.
- All critical components redundant and hot swappable[2].
- Power supplies purpose designed for data storage.
- Aluminum device carriers for heat dissipation and emissions protections, thereby keeping drives cooler and increasing MTBF.
- AC or DC input voltage options.
- Automatic termination on SCSI Bus, no need for external termination.

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1. Note that the use of legacy devices will prevent 80 MB/s transfer rates and effectively reduces the system to the speed of the slowest device on the bus and will reduce external cable length to 1.5 meters.
2. This does not apply to the VEM which is not hot swappable. It is recommended that all host I/O activity has stopped before hot swapping components.

Device Carriers

Front loaded components such as disk drives and power supplies are housed in easily removable device carriers. The device carrier is the basic building block of the series. The device carriers are manufactured using a high quality anodized metal construction. This allows for rapid heat dissipation and conforms to the stringent requirements of CE and FCC standards. A release mechanism ensures the safe and easy insertion and removal of the device carrier.

Cooling

All models feature three 4-speed Advanced Cooling Modules (ACMs) per shelf. The modules are mounted at the rear of the unit. In the event of an ACM failing the remaining ACMs are capable of cooling the entire shelf until the failed ACM is replaced. This gives N+1 redundancy.

Power Supplies

The XL500 Ultra2 SCSI Storage Array system uses two high performance power supply units per backplane. A single power supply is capable of powering the shelf in the event the second power supply fails. Each power supply has greater than 500,000 hours Mean Time Between Failures (MTBF), however, using two power supplies in the system provides full redundancy capabilities. There are two power supply options available: an AC power supply and a DC power supply. The power supply options are discussed in Chapter 3.

Disk Shelf

The disk shelf is made up of nine bays (7 disk drive bays and 2 power supply bays) and forms the housing for devices within the system. It is also possible to rackmount the shelf in a standard 19 inch equipment rack thus providing large datacentre capabilities.

Disk Drives

Seven SCA disk drives are supported per storage array. On powering up the XL500 Ultra2 SCSI Storage Array disk drives 0, 4, 5, 6 will spin up immediatly. Disk drive 1 will spin up after 12 seconds, disk drive 2 will spin up after 24 seconds and disk drive 3 will spin up after 36 seconds.

Environmental Monitoring

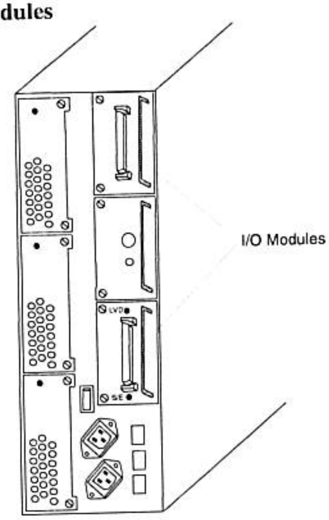
All device carriers and ACM's have LEDs on the front which give information about the status of the devices or power supplies.

A Versatile Environmental Monitor (VEM) is installed which monitors the ACMs, power supply voltage outputs, disk drives and temperature, and controls the ACM speed.

Intelligent I/O Modules

The XL500 Ultra2 SCSI Storage Array has two I/O modules installed as shown in Figure 1-1. The top I/O module allows connection to a host system, or connection from another XL500 Ultra2 SCSI Storage Array in a daisy chain configuration. The bottom I/O module auto-sense where the end of the SCSI Bus is and applies termination automatically (no external terminators are necessary). This bottom I/O module auto-senses if Single Ended SCSI or LVD mode is being used and indicates this using LEDs on the bottom I/O module.

Figure 1-1. I/O Modules



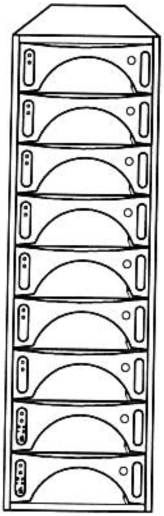
Configurations

This section details the standard configurations available in the XL500 Ultra2 SCSI Storage Array range of products. There are two main configurations; Single Tower and datacentre rack mount configurations. The rack mount systems can be mounted in any standard 19 inch equipment rack. It is also possible to daisy chain rackmount shelves or tower systems together.

XL501T

The XL500 Ultra2 SCSI Storage Array single tower configuration consists of a single storage shelf with 3 Advanced Cooling Modules (ACMs), 2 Power Supply Units (PSUs), 1 Ultra2 Wide SCSI bus, and support for up to 7 disk drives. This single tower option has capacity for up to 126 GBytes (using 7 x 18GB disk drives)[3]. The single tower XL500 Ultra2 SCSI Storage Array is shown in Figure 1-2 below.

Figure 1-2. Front View of XL501T



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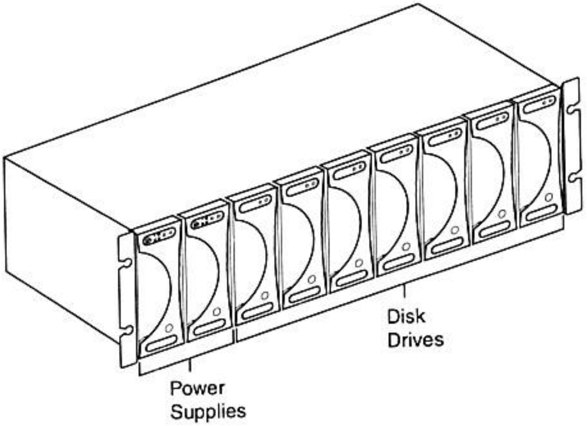
[3] This value will increase to 252GB if 36GB drives are used.

XL501R

The XL500 Ultra2 SCSI Storage Array rackmount configuration is similar to the single tower configuration and consists of a single storage shelf with 3 Advanced Cooling Modules (ACMs), 2 Power Supply Units (PSUs), 1 Ultra2 Wide SCSI bus, and support for up to 7 disk drives. This rackmount configuration has capacity for 126GBytes (using 7 x 18GB disk drives)[4]. The XL501R can be mounted in any equipment rack with a front width of 19 inches. The rackmount XL500 Ultra2 SCSI Storage Array is shown in Figure 1-3 below.

Figure 1-3. Front View of XL501R



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[4] This will increase to 252GB if 36GB disk drives are used.

Chapter 2: Unpacking and Initial Setup

On receipt of the system visually inspect the exterior of the packaging for any signs of damage. If any damage is found the carrier and Eurologic should be informed immediately, and they will advise you of the appropriate action. The cartons are sealed using packaging tape which should be cut open in the normal manner. Remove the top foam layer from each box and exercise caution when lifting out the components. At this point the contents should be verified against the packing list and Eurologic should again be notified if any discrepancies exist. The devices and power supply units are packaged in anti-static packaging and anti-static precautions must be observed prior to removal. The devices and power supply units can now be inserted into the tower or shelf.

NOTE: All illustrations in this manual refer to the AC power input version of the XL500 Ultra2 SCSI Storage Array.

CAUTION: This equipment is intended only for installation in a restricted access location.

Recommendations for Installing Rackmount XL500 Ultra2 SCSI Storage Array in a Standard 19 in. Rack

It is essential that the following guidelines are complied with to ensure the safe and efficient operation of the XL500 Ultra2 SCSI Storage Array rackmount system. Eurologic's rackmount systems may be installed in closed or open rackmount systems by observing the environmental, electrical, and mechanical precautions listed in the following paragraphs.

Ambient Temperature

Installation of rackmount systems in standard 19 in. cabinets may lead to a differential between the room ambient temperature and the internal ambient temperature of the rack environment. The maximum operating temperature of the XL500 Ultra2 SCSI Storage Array is 40 degrees centigrade, however, it is not recommended that the system is continuously run at these elevated temperatures. Consideration should therefore be given to ensuring that the room ambient temperature is compatible with these specifications. For example, if the internal temperature of the XL500 Ultra2 SCSI Storage Array is 25 degrees centigrade then the room ambient temperature should not exceed 15 degrees centigrade.

Air Flow

To ensure that the internal heat build up is adequately dissipated into the room environment, air flow should not be restricted. It is essential that no vents are blocked, and that the system is a minimum of 1 meter away from a solid surface such as a wall or partition. Air flow through the XL500 Ultra2 SCSI Storage Array shelves is from front to rear.

Mechanical Loading

Consideration should be given to the loading of the cabinet. To maintain a low centre of gravity (thus reducing the likelihood of instability) racks should be installed (where possible) from the bottom of the cabinet upwards. This is recommended to ensure personal safety.

Electrical Considerations

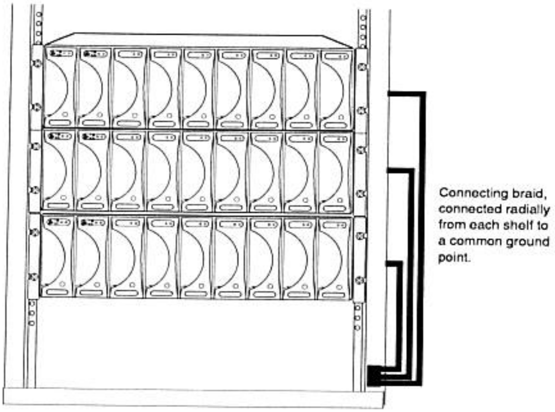
Circuit Overloading

Care should be taken to ensure that the current does not exceed the rating of the power source circuitry. This includes cabling, power distribution units, filters and any other components through which the main AC flows. The power requirements of the XL500 Ultra2 SCSI Storage Array shelf is 1.5 Amps @ 200 Volts and 3 Amps @ 100 Volts[1] and must be added to the power demands of any other electrical devices installed in the cabinet to arrive at a total power consumption figure. In addition surge currents must be catered for. Disk devices normally consume twice the amount of current at start up time as they do during steady state operation.

Grounding

Eurologic recommends that all rackmount shelves be grounded to a common point in the cabinet in a radial topology as shown in Figure 2-1.

Figure 2-1. Grounding shelves within a 19 in. cabinet


Connecting braid, connected radially from each shelf to a common ground point.

A grounding point for securing the braid is provided at the rear of the rack mount shelf.

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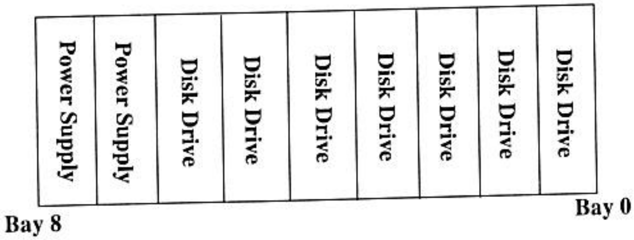
[1] This figure may vary slightly depending on the redundancy mechanisms incorporated, the number of device bays occupied and the device type occupying the bays.

Device Insertion

This section details how to install and remove power supply units, disk drives and advanced cooling modules (ACMs). The installation and removal of a disk shelf is also covered. The position of the power supplies and the disk drives within the shelf or tower is shown in Figure 2-2.

CAUTION: Allow disk drives and power supplies to reach room ambient temperature before powering on the shelf.

Figure 2-2. Location of devices in tower or shelf



WARNING: Before attempting to install or remove any of the components, ensure that anti-static precautions have been taken. The minimum requirement is an anti-static wrist strap and grounding wire.

Power Supply Insertion

Power supplies are housed in device carriers to allow for easy insertion. The power supply is designed for hot swappable operation.

NOTE: Always leave a delay of 1 minute between removal and installation of a power supply.

Installing a Power Supply

1. Orient the power supply carrier so that the LEDs are on the left and the ejection button is on the right (for rackmount systems the LEDs and button are on the top and bottom respectively).

2. Insert the power supply carrier into either bay 7 or bay 8 of the shelf (see Figure 2-2).
3. Push the carrier into the bay until you feel the power supply engage the backplane and the ejection button on the front is fully extended. If the button is not fully extended, apply additional pressure to the front of the device carrier.
4. Pull on the carrier to ensure that it does not come out and is locked in place.

Disk Drive Insertion

Disk drives are housed in device carriers to allow for easy insertion.

Installing a Disk Drive

1. Orient the disk drive carrier so that the LEDs are on the left and the ejection button is on the right (for rackmount systems the LEDs and button are on the top and bottom respectively).
2. Insert the disk drive carrier into any of the bays 0 through 6 of the tower or shelf (see Figure 2-2).
3. **Gently** push the carrier into the bay until you feel the disk drive engage the backplane and the ejection button on the front is fully extended. If the button is not fully extended, apply additional pressure to the front of the carrier.
4. Pull on the carrier to ensure that it does not come out and is locked in place.

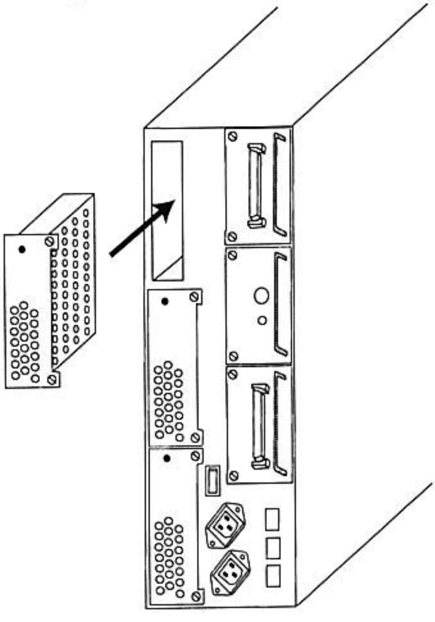
Advanced Cooling Module Insertion

The XL500 Ultra2 SCSI Storage Array is supplied with three ACMs mounted on the rear.

Installing an Advanced Cooling Module (ACM)

1. Hold the ACM at 90° to the rear of the XL500 Ultra2 SCSI Storage Array.
2. Slide the ACM into an empty ACM slot (see Figure 2-3).
3. Using the two thumbscrews on the ACM assembly secure the ACM in place.

Figure 2-3. Installing an ACM



Rack Mounting a XL500 Ultra2 SCSI Storage Array Shelf

The XL500 Ultra2 SCSI Storage Array rack mount shelf can be installed in a standard 19 inch equipment rack. To ensure correct functionality of the rack mounted shelf the guidelines set out previously in this chapter regarding environmental, mechanical and electrical recommendations must be followed.

NOTE: When installing or removing a rack mount shelf, remove all power supplies and disk drives. It is recommended that you work with at least one other person when installing a disk shelf. This is necessary to prevent personal injury and damage to the shelf.

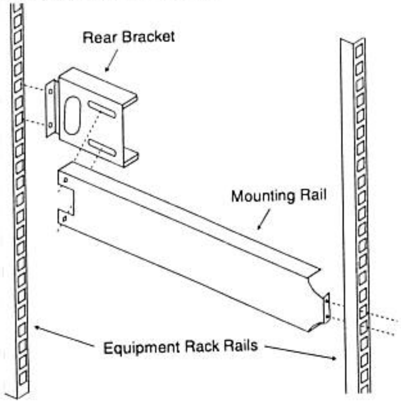
There are two parts to rackmounting a XL500 Ultra2 SCSI Storage Array in an equipment rack. Firstly the mounting rails have to be installed and then the shelf can be installed on the mounting rails.

Installing the Mounting Rails (see Figure 2-4)

1. Attach the rear bracket to the mounting rail using the two fixing bolts provided but do not tighten the bolts. This allows for adjustment to fit your equipment rack.
2. Using the fixing screws provided attach the rear bracket to the rear rails of your equipment rack.
3. Using the fixing screws provided attach the mounting rail to the front rail of your equipment rack.
4. Tighten the bolts joining the rear bracket to the mounting rail (from step 1).
5. Repeat this procedure for the opposite side.

The mounting rails are now in place and the XL500 Ultra2 SCSI Storage Array can be mounted in the equipment rack as described below.

Figure 2-4. Installing the mounting rails



Installing a Shelf in an Equipment Rack

To install a shelf in a standard 19 inch equipment rack, follow this procedure:

1. Install the mounting rails as described above.
2. Onto the mounting rails install the XL500 shelf and secure in place using the four mounting screws provided.
3. Tighten the mounting screws.

Chapter 3: Cabling and Configuration

This Chapter describes how to configure and set up the XL500 Ultra2 SCSI Storage Array. This Chapter will also describe the procedure for connecting the XL500 Ultra2 SCSI Storage Array to a host system.

Each backplane will support 7 disk drives using 80 pin SCA2 connectors. Two power supplies will provide the power for the system. The disk drives are configured on one SCSI Bus.

Configuration Options

The XL500 Ultra2 SCSI Storage Array can be configured in the following ways:

- Single shelf, single host, no VEM
- Single shelf, single host, with VEM
- Single shelf, dual host, no VEM
- Single shelf, dual host, with VEM
- Two shelves, single host, no VEM
- Two shelves, single host, dual VEM
- Two shelves, dual host, no VEM
- Two shelves, dual host, dual VEM

These configurations are selected by the use of the three switches located at the rear of the XL500 Ultra2 SCSI Storage Array. Details of how to set these switches will be given later in this Chapter.

Configuration Rules

This section sets out the rules which must be observed when selecting a configuration option for the XL500 Ultra2 SCSI Storage Array.

WARNING: These rules must be observed prior to configuring the XL500 Ultra2 SCSI Storage Array

Single Shelf per SCSI Bus

1. A single shelf must be set to First shelf (see page 3-3).
2. A single shelf may be either Single Host or Dual Host (see page 3-4).
3. If a VEM card is used the VEM switch (see page 3-4) must be set to Single VEM.

Two Shelves on One SCSI Bus

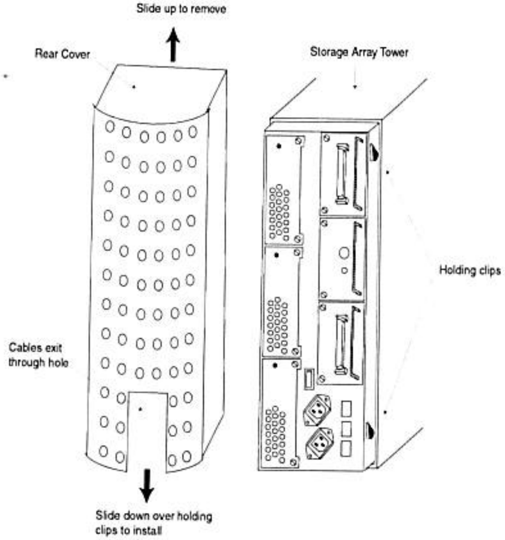
1. One shelf must be set to First, and the second shelf must be set to Second (see page 3-3).
2. Both host switches can be set to single host or dual host, but both switches must be the same (see page 3-4).
3. If two VEM cards are used, both VEM switches must be set to Dual VEM (see page 3-4).
4. If Dual Host is used, **OR** if Dual VEM is used, the disk drives nearest the power supply on the Second shelf must be left empty.
5. If Dual Host **AND** Dual VEM is used the two disk drives nearest the power supply on the Second shelf must be left empty.

Removing the Rear Cover

The XL500 Ultra2 SCSI Storage Array system tower option has a rear cover (see Figure 3-1) that has to be removed to reveal the I/O connectors, power connectors and the VEM. The rear cover is removed by sliding it upwards over the holding clips as shown below.

To install the cover slide it down over the holding clips as shown below. All cables should exit through the hole in the rear cover as shown.

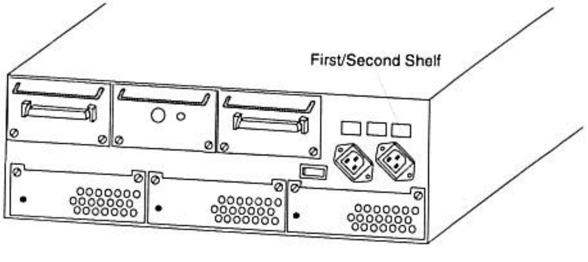
Figure 3-1. Rear Cover



Setting First/Second Shelf

This switch enables a shelf to be set as the First or Second shelf. In Single shelf configurations this switch should always be set at First. In Dual shelf configurations, one shelf must be set as First and the second shelf must be set as Second. The switch is located at the rear of the shelf (see Figure 3-2). To set the shelf to First, the switch should be set to "First". To set the shelf to Second, the switch should be set to "Second".

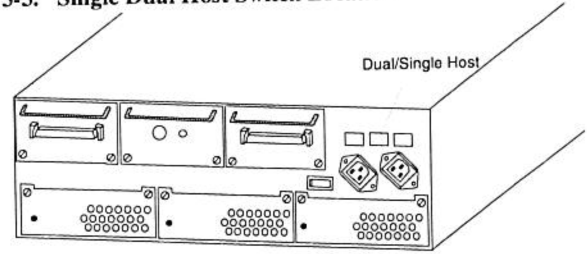
Figure 3-2. First/Second Switch Location



Setting Single/Dual Host

This switch enables a shelf to be set up for Single or Dual Host. A single shelf may be either single or dual host. In dual shelf configurations both host switches can be set to single host or dual host, but both switches must be the same. The switch is located at the rear of the shelf (see Figure 3-3). To set a shelf to Single Host, the switch should be set to "1". To set a shelf to Dual Host the switch should be set to "2".

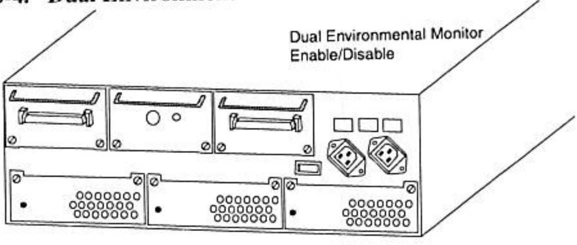
Figure 3-3. Single Dual Host Switch Location



Setting Dual VEM Enable/Disable

This switch enables Dual VEM to be Enabled or Disabled for a shelf. If none or one VEM card is used the Dual Environmental Monitor Enable/Disable switch must be set to disabled. If two VEM units are used, the Dual Environmental Monitor Enable/Disable switch on both shelves must be set to enabled. The switch is located at the rear of the shelf (see Figure 3-4). To set the Dual Environmental Monitor to Enabled the switch should be set to "2". To set the Dual Environmental Monitor to Disabled the switch should be set to "0 or 1".

Figure 3-4. Dual Environmental Monitor Enable/Disable Switch Location

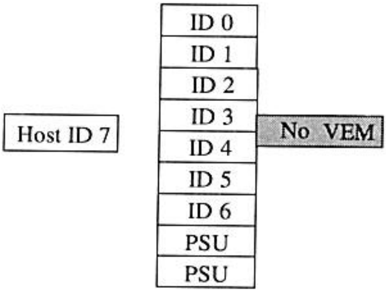


SCSI ID Selection

This section describes the SCSI ID mapping used in the XL500 Ultra2 SCSI Storage Array. In the following sections the SCSI ID mapping for each of the configurations described at the beginning of this Chapter will be shown. Each configuration is selected using the three configuration switches described earlier in this Chapter.

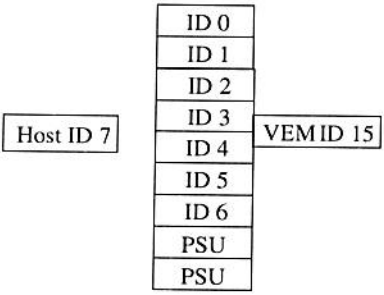
Single Shelf, Single Host, no VEM

First/Second shelf switch set to "First", Single/Dual Host switch set to "1" and Dual Environmental Monitor switch set to "0 or 1". The SCSI ID mapping is shown.



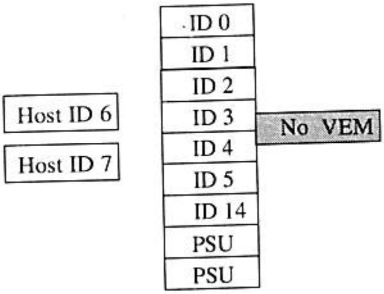
Single Shelf, Single Host, with VEM

First/Second shelf switch set to "First", Single/Dual Host switch set to "1" and Dual Environmental Monitor switch set to "0 or 1". The SCSI ID mapping is shown.



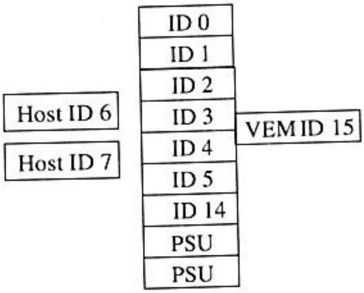
Single Shelf, Dual Host, no VEM

First/Second shelf switch set to "First", Single/Dual Host switch set to "2" and Dual Environmental Monitor switch set to "0 or 1". The SCSI ID mapping is shown.



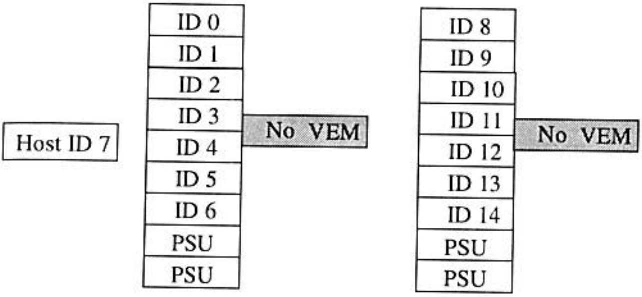
Single Shelf, Dual Host, with VEM

First/Second shelf switch set to "First", Single/Dual Host switch set to "2" and Dual Environmental Monitor switch set to "0 or 1". The SCSI ID mapping is shown.



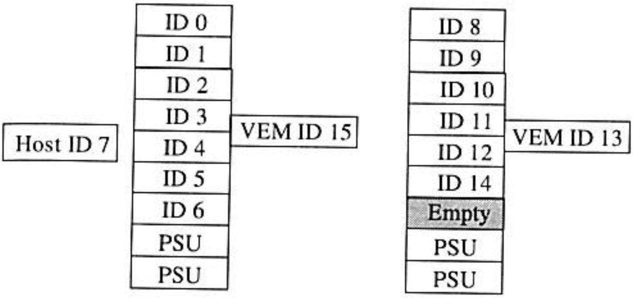
Two Shelves, Single Host, no VEM

First/Second shelf switch set to “First” on first shelf and set to “Second” on second shelf, Single/Dual Host switch set to “1” on both shelves and Dual Environmental Monitor switch set to “0 or 1” on both shelves. The SCSI ID mapping is shown.



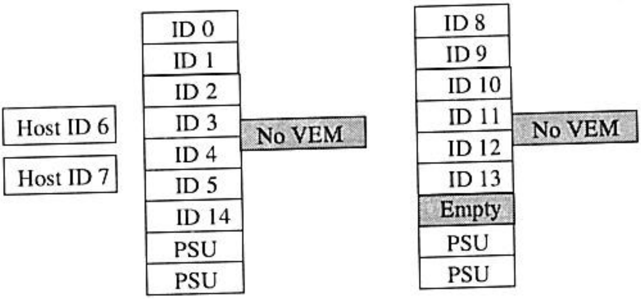
Two Shelves, Single Host, Dual VEM

First/Second shelf switch set to “First” on first shelf and set to “Second” on second shelf, Single/Dual Host switch set to “1” on both shelves and Dual Environmental Monitor switch set to “2” on both shelves. The SCSI ID mapping is shown.



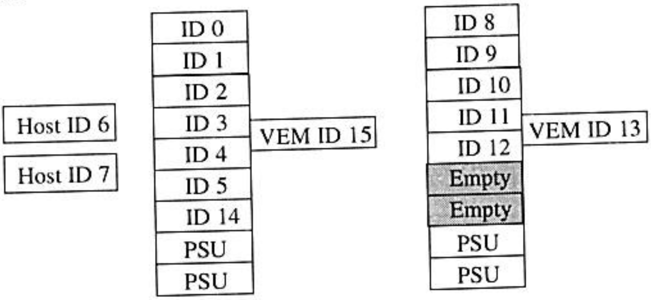
Two Shelves, Dual Host, no VEM

First/Second shelf switch set to "First" on first shelf and set to "Second" on second shelf, Single/Dual Host switch set to "2" on both shelves and Dual Environmental Monitor switch set to "0 or 1" on both shelves. The SCSI ID mapping is shown.



Two Shelves, Dual Host, Dual VEM

First/Second shelf switch set to "First" on first shelf and set to "Second" on second shelf, Single/Dual Host switch set to "2" on both shelves and Dual Environmental Monitor switch set to "2" on both shelves. The SCSI ID mapping is shown.



Connecting to a Host System

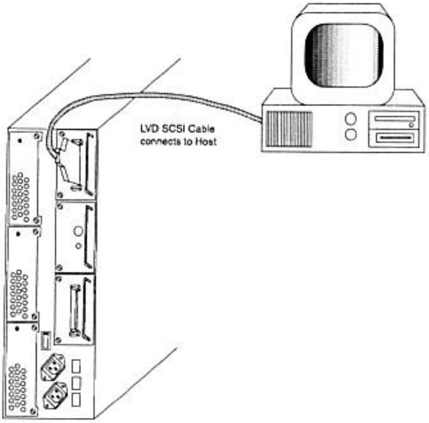
This section describes the procedure for connecting the XL500 Ultra2 SCSI Storage Array to a host(s) system.

NOTE: This section describes the connectors on the XL500 Ultra2 SCSI Storage Array, it does not describe the connectors on the host system. For information relating to the host system, refer to the host systems User Guide.

Single Shelf, Single Host

In this configuration a single XL500 Ultra2 SCSI Storage Array shelf is connected to a single host system. The SCSI cable is connected to the top I/O connector on the rear of the XL500 Ultra2 SCSI Storage Array shelf. The other end of this cable is connected to the host system (see Figure 3-5). The First/Second Shelf ID switch should be set to "First". The Single/Dual Host ID switch should be set to "1". The Dual Environmental Monitor Enable/Disable ID switch should be set to "0 or 1". No external terminator is required because the bottom I/O connector (closest to power supplies) of the shelf has in-built termination. If there is a cable attached to this I/O connector, termination is turned off automatically. If there is no cable attached to this I/O connector, termination is turned on automatically.

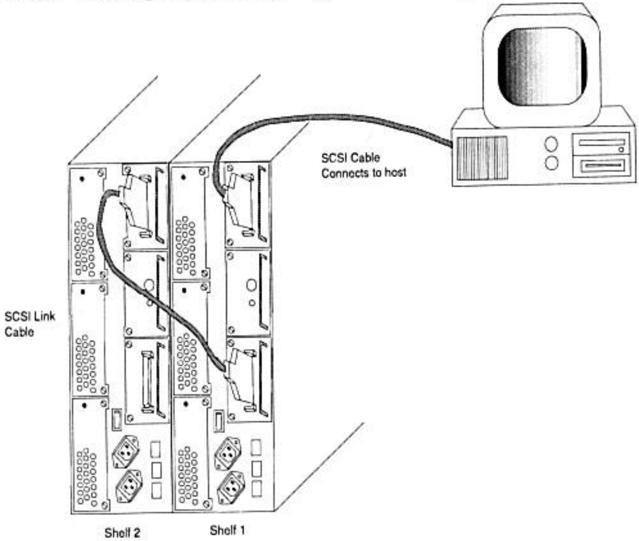
Figure 3-5. Cabling Single Shelf, Single Host Configuration



Dual Shelf, Single Host

In this configuration two XL500 Ultra2 SCSI Storage Array shelves are daisy chained together and connected to a single host system. The SCSI cable is connected to the top I/O connector of Shelf 1, the other end of this cable is connected to the host system. The bottom I/O connector of Shelf 1 is connected (using the SCSI Link Cable) to the top I/O connector of Shelf 2 (see Figure 3-6). The First/Second Shelf ID switch on Shelf 1 should be set to "First" and on Shelf 2 should be set to "Second". The Single/Dual Host ID switch on both shelves should be set to "1". As there is a VEM installed in each shelf in the example shown, the Dual Environmental Monitor Enable/Disable ID switch should be set to "2" on both shelves (if a VEM is not installed in the shelves then this switch should be set to "0 or 1" on both shelves). No terminator is required because the bottom I/O connector (closest to power supplies) of each shelf has in-built termination. If there is a cable attached to this I/O connector, termination is turned off automatically. If there is no cable attached to this I/O connector, termination is turned on automatically. In the example below, termination is turned off on the bottom I/O connector of shelf 1 and is turned on on the bottom I/O connector of shelf 2.

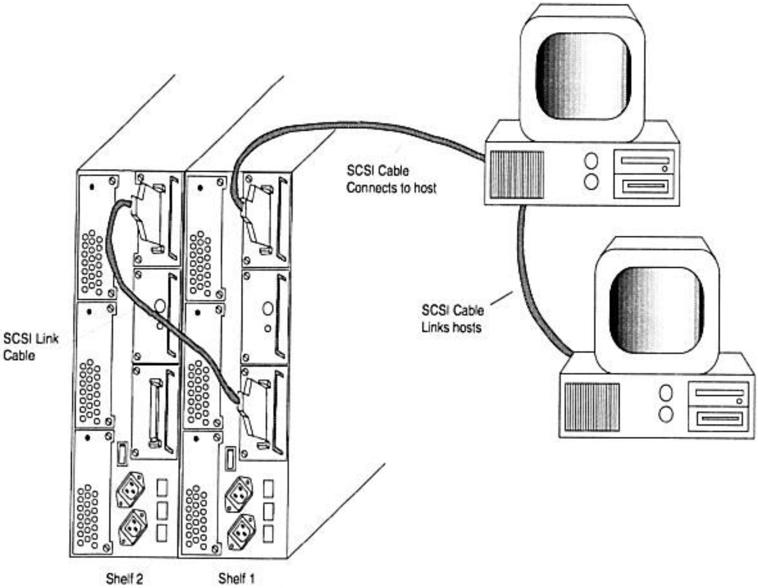
Figure 3-6. Cabling Dual Shelf, Single Host Configuration



Dual Host Configurations

Both the single shelf and dual shelf configurations described above may be connected to dual host systems. This is achieved by daisy chaining the host computers together (see Figure 3-7). When connecting either a single or dual shelf configuration to dual hosts, ensure that the Single/Dual Host ID switch is set to Dual (on both shelves for dual shelf configurations).

Figure 3-7. Cabling dual host configurations



NOTE: Both host computers must have a SCSI adapter card installed. It is also possible to have two SCSI adapter cards in a single host computer. This is also regarded as a dual host configuration.

Power Supply Options

The XL500 Ultra2 SCSI Storage Array offers a choice of two power supply options as follows:

Autoranging 260W Power Supply Unit

The Autoranging 260W Power Supply Unit is a two output switch mode power supply, equipped with power sharing and N+1 units redundancy capability. It is especially designed for Storage Systems. See Appendix B for output pin assignment.

260W DC Power Supply Unit

The 260W DC Power Supply Unit is equipped with power sharing and N+1 units redundancy capabilities. It is especially designed for Storage Systems. See Appendix B for output pin assignment.

Power Input Module Options

The XL500 Ultra2 SCSI Storage Array offers four power input module options as follows:

- Dual DC Power Input without on/off switch
- Dual AC Power Input without on/off switch
- Dual AC Power Input with on/off switch
- Single AC Power Input with on/off switch

Chapter 4: Environmental Monitoring

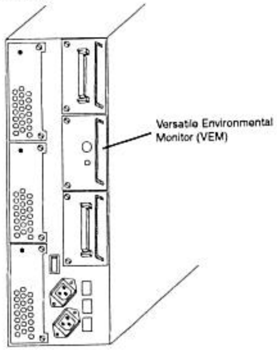
This Chapter deals with the various methods used to monitor the XL500 Ultra2 SCSI Storage Array. The methods used are as follows:

- Versatile Environmental Monitor (VEM) - The VEM is a card that plugs into the backplane of the XL500 Ultra2 SCSI Storage Array. The VEM monitors the ACMs, power supply voltage outputs and enclosure temperature. The output from the VEM may be sent to a display unit or, more comprehensively, may be used as an input to Eurologic's Vision Software. The VEM uses in-band reporting and supports both SES and SAF-TE protocols.
- Device Carrier LEDs - All device carriers have two LEDs on the front which give details about the operational status of the disk drives and power supplies. The Red LED on the bottom is driven by the VEM. The Green LED on the top is driven by the disk drive and power supply.
- Fan Control Module - The Fan Control Module will be shipped with all standard XL500 U2 configurations. The Fan Control Module is a card that plugs in to the backplane of the XL500 Ultra2 SCSI Storage Array. The Fan Control Module controls the fan speed and provides termination power to the system. This Fan Control Module does not provide any in-band monitoring, SES or SAF-TE support. The Fan Control Module does not drive any LEDs.

Versatile Environmental Monitor (VEM)

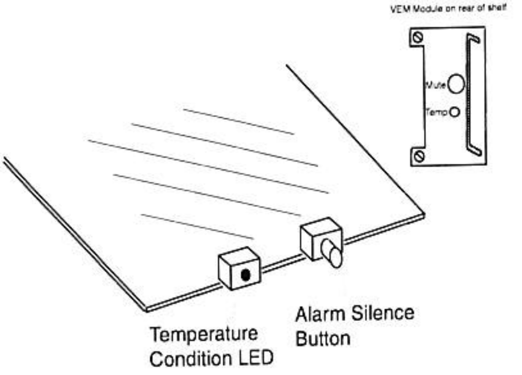
The VEM is primarily an environmental monitoring device. It sits on the backplane of the XL500 Ultra2 SCSI Storage Array (see Figure 4-1).

Figure 4-1. VEM Location



The VEM gathers information about the state of the devices in the XL500 Ultra2 SCSI Storage Array, such as power supplies, disk drives, Advanced Cooling Modules and enclosure temperature. It communicates with the host system using in-band reporting. This section will describe the function of the VEM and how to interpret the LEDs and audible alarm fault indicators. A diagram of the VEM, showing it's main components can be seen in Figure 4-2.

Figure 4-2. Versatile Environmental Monitor



VEM Function

There are three main functions of the VEM. These functions are as follows:

- Collect data from the various "sensors" in the enclosure. Monitor this data, and activate various visible and audible indicators to denote failures and other conditions in the enclosure. Controls the ACM speed also.
- Report the collected data to a host application using a variety of communications interfaces and data formats.
- Receive "control" information from a host application (using a variety of communications interfaces and data formats) and carry out the "commands" contained therein.

In-Band Reporting

The Versatile Environmental Monitor (VEM) communicates with the host system using in-band reporting. The VEM supports both SAF-TE and SES protocols. The VEM card sits on the SCSI bus and communicates directly to the host(s). The VEM card has it's own SCSI ID (see below) and is seen as a separate target by the host(s).

VEM SCSI ID

The VEM sits on the SCSI bus and as such it is assigned a SCSI ID. The VEM is assigned a SCSI ID of 15 for single shelf configurations and a SCSI ID of 15 and 13 for dual shelf configurations that must have a VEM in each shelf. **For more details on the SCSI ID mapping refer to Chapter 3.**

VEM Fault Notification

The VEM has an LED mounted on it to warn of over temperature conditions. If an over temperature condition exists, the temperature LED (Temp) will come on, and the alarm buzzer will sound. The alarm buzzer can be turned off by using the Alarm Silence Button (Mute) on the VEM card.

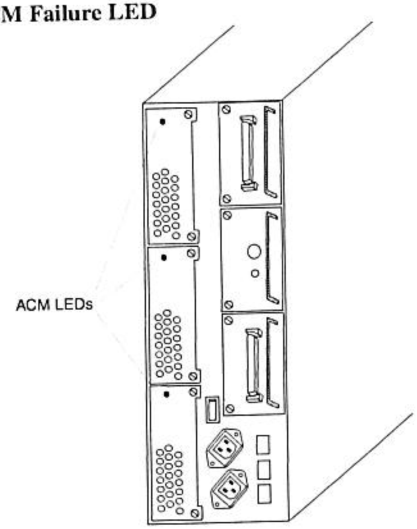
NOTE: The alarm silence button (Mute) temporarily silences the alarm buzzer; it does not stop the error LEDs from flashing.

In addition to the temperature LED mounted on the VEM card, the VEM also drives fault LEDs mounted on each ACM assembly, Power Supply Carrier and Disk Drive Carrier.

Advanced Cooling Module Failure LED

Each ACM has a fault LED built into it as can be seen in Figure 4-3.

Figure 4-3. ACM Failure LED

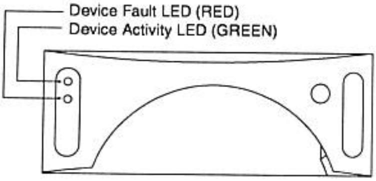


If an ACM fails the ACM Failure LED on the failed ACM will come on, and the alarm buzzer on the VEM card will sound. The alarm buzzer may be silenced by pressing the alarm silence button (Mute).

Disk Drive Carrier LEDs

Each disk drive carrier in a disk shelf has two LED indicators on the front as shown in Figure 4-4.

Figure 4-4. LEDs On Disk Drive Carrier



The disk drive LEDs function as follows:

- The Green LED on the top is the device activity indicator. It is on or flashing when the disk is active. This LED is driven by the disk drive.
- The Red LED on the bottom is the device fault indicator. This LED is steadily on when the disk has failed[1]. This LED is driven by the VEM - under SES and SAF-TE control.

Table 4-1 shows how to interpret the LEDs.

---

[1] This LED will, at the hosts request flash when the Disk Drive is spinning up or down.

Table 4-1 Device carrier LED definitions

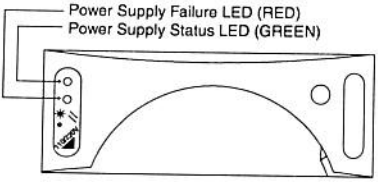
Device fault LED	Device activity LED	Meaning
Off	On	Disk operates normally
Off	Flashing	Disk operates normally
Off	Off	Disk is inactive and there is no fault
On	On	Fault status. Disk may not be responding to control signals and may be bad, or may need a power-off reset. If the problem persists, replace the disk.
On	Off	Fault status. Disk is inactive and spun down. Replace the disk.
Flashing[1]	On	Disk is spinning up or down during a hot swap, or spinning down because of an error.
Flashing[1]	Off	Fault status. Disk has failed. Replace the disk.

[1] This will only happen at the request of the host system.

Power Supply Carrier LEDs

The power supply for the disk shelf has two LED indicators (see Figure 4-5).

Figure 4-5. LEDs On Power Supply Carrier


Power Supply Failure LED (RED)
Power Supply Status LED (GREEN)

These power supply status LEDs function as follows:

- The green LED on the top is the power supply status indicator. This LED is driven by the power supply.
- The red LED on the bottom is the power supply failure LED. It is normally off. If a failure has occurred, this LED turns on steadily or flashes at regular intervals. This LED is driven by the VEM. See Table 4-2 for the meaning of the LED interval patterns.

Table 4-2 Power supply LEDs

LED color/location	LED activity	Meaning
Green - top	On	Power supply is functioning properly.
	Off	An input power problem exists or the power supply is not functioning properly.
Red - bottom	Off	Power supply is functioning properly
	On	Power supply malfunction or input power problem exists.

Failure LED Table

This table shows which error LEDs will come on when a fault occurs. In all fault conditions the alarm buzzer will sound.

	Drive LED	PSU LED	ACM LED	VEM LED
Drive Fault	●			
PSU Fault		●		
ACM Fault			●	
Temp. Condition				●

For more detailed information on the Disk drive and Power Supply LEDs see pages 4-5 and 4-7 respectively.

Fan Control Module

The Fan Control Module plugs into the backplane of the XL500 Ultra2 SCSI Storage Array. The Fan Control Module will be shipped with all standard XL500 U2 configurations. It controls the fan speed and provides termination power to the system. This Fan Control Module does not provide any in-band monitoring, SES or SAF-TE support. The Fan Control Module will not drive any of the fault LEDs on the disk drives, power supplies or ACMs.

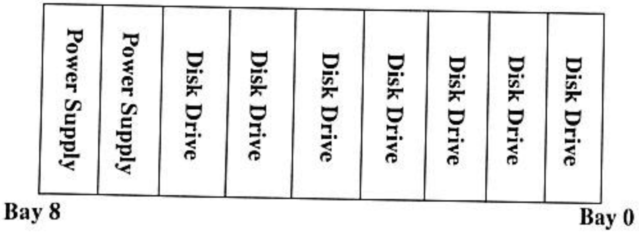
Chapter 5: Replacing Components

This chapter deals with replacing components in the XL500 Ultra2 SCSI Storage Array from a field replaceable point of view. It will go through the procedure for removing and installing components such as the disk drives, power supplies, ACMs, and the VEM. The procedure for replacing a disk shelf in an equipment rack is also described.

Device Insertion and Removal

The position of the power supplies and the disk drives within the tower is shown in Figure 5-1.

Figure 5-1. Location of Devices in Tower



WARNING: Before attempting to install or remove any of the components, ensure that anti-static precautions have been taken. The minimum requirement is an anti-static wrist strap and grounding wire.

CAUTION: It is recommended that all host activity be stopped during insertion or removal of devices.

Power Supply Insertion and Removal

Power supplies are housed in removable carriers to allow for easy insertion and removal. The power supply is designed for hot swappable operation. To achieve this, temperature sensitive current limiting is used. As the temperature to the power supply increases the current limiting function decreases, preventing undesirable surges. If removing and replacing the *same* power supply you must ensure that at least one (1) minute has elapsed between removal and re-insertion. This is necessary to allow components to cool to ambient temperatures.

Removing a Power Supply

To remove a power supply unit follow this procedure:

1. Press the ejection button on the front of the power supply.
2. With the ejection button still pressed grasp the carrier handle and slowly pull the power supply out of the tower. Use both hands to support the weight of the power supply.

Installing a Power Supply

To install a power supply unit follow this procedure:

1. Orient the power supply carrier so that the LEDs are on the left and the ejection button is on the right (for rackmount systems the LEDs and ejection button are on the top and bottom respectively).
2. Insert the power supply carrier into either bay 7 or bay 8 of the tower (see Figure 5-1).
3. Push the carrier into the bay until you feel the power supply engage the backplane and ejection button on the front is fully extended. If the button is not fully extended, apply additional pressure to the front of the device carrier.

Disk Drive Insertion and Removal

Disk drives are housed in device carriers to allow for easy insertion and removal. Prior to removal of the disk drive from the tower, you must ensure that the disk drive has fully spun down. This is necessary as centifugal forces may damage the drive. Allow a minimum period of one minute for the drive to spin down completely. You must make sure that adequate shock precautions are complied with.

WARNING: Before removing a disk drive you must ensure that there is no I/O activity on the drive.

Removing a Disk Drive

To remove a disk drive follow this procedure:

1. Press the ejection button on the front of the disk drive carrier.
2. With the ejection button still pressed grasp the carrier handle and slowly pull the disk drive out of the tower. Use both hands to support the weight of the disk drive.

Installing a Disk Drive

To install a disk drive follow this procedure:

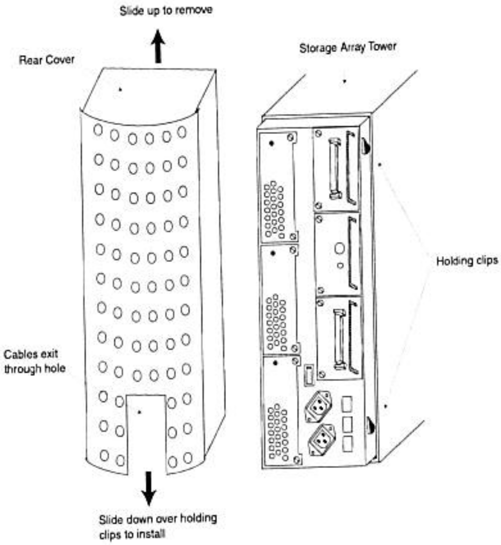
1. Orient the disk drive carrier so that the LEDs are on the left and the ejection button is on the right (for rackmount systems the LEDs and ejection button are on the top and bottom respectively).
2. Insert the disk drive carrier into any of bays 0 through 6 of the tower (see Figure 5-1).
3. Push the carrier into the bay until you feel the disk drive engage the backplane and ejection button on the front is fully extended. If the button is not fully extended, apply additional pressure to the front of the carrier.

Removing/Installing the Rear Cover

The XL500 Ultra2 SCSI Storage Array system tower option has a rear cover (see Figure 5-2) that has to be removed to reveal the I/O connectors, power connectors and the VEM. The rear cover is removed by sliding it upwards over the holding clips as shown below.

To install the cover slide it down over the holding clips as shown below. All cables should exit through the hole in the rear cover as shown.

Figure 5-2. Rear Cover



Advanced Cooling Module Insertion and Removal

The XL500 Ultra2 SCSI Storage Array is supplied with three ACMs mounted on the rear of each shelf. The ACMs are removable and hot swappable. The air flow created by the ACMs is from front to rear.

WARNING: Once you have removed an ACM from the tower or shelf you must block the resulting hole within 3 minutes. The hole may be blocked by installing a new ACM or by replacing the failed ACM until a replacement is obtained. Failure to do so can seriously disrupt air flow.

Removing an Advanced Cooling Module (ACM)

To remove an advanced cooling module from the shelf follow this procedure:

1. Loosen the two captive thumbscrews that secure the ACM to the shelf.
2. Pull the ACM assembly out of the tower.

Installing an Advanced Cooling Module (ACM)

To install an Advanced Cooling Module in a tower follow this procedure:

1. Hold the ACM assembly at 90 degrees to the shelf.
2. Insert the ACM into the empty ACM slot.
3. Align the two thumbscrews on the ACM with the threaded holes on the shelf.
4. Tighten the thumbscrews.

Versatile Environmental Monitor Insertion and Removal

The VEM is an environmental monitoring device that sits on the backplane of the XL500 Ultra2 SCSI Storage Array. It monitors the Disk Drives, Power Supplies, ACMs and enclosure temperature.

Removing a VEM

To remove a VEM follow this procedure:

1. Switch off the power to the shelf, ensuring that there is no activity on the SCSI bus.
2. Loosen the two thumbscrews on the VEM.
3. Using the handle slowly pull the VEM out of the shelf.

Installing a VEM

To install a VEM follow this procedure:

1. Ensure that the power to the storage shelf has been turned off.
2. Insert the VEM into the VEM slot on the rear of the shelf.
3. Press the VEM firmly into place ensuring a good connection is made between the connector on the VEM and the connector on the backplane.
4. Align the two thumbscrews on the VEM with the holes on the rear of the shelf.
5. Tighten the thumbscrews.

I/O Module Insertion and Removal

There are two I/O modules located at the rear of the XL500 Ultra2 SCSI Storage Array. These modules allow the self to be connected to a host system(s) and also allow for daisy chaining shelves together.

CAUTION: Before removing an I/O module ensure that all I/O activity to the XL500 Ultra2 SCSI Storage Array has stopped.

Removing an I/O Module

1. Loosen the two captive thumbscrews on the I/O module.
2. Using the handle slowly pull the I/O module out of the shelf.

Installing an I/O Module

1. Insert the I/O module into the I/O slot on the rear of the shelf.
2. Press the I/O module firmly into place ensuring a good connection is made between the connector on the I/O module and the connector on the back-plane.
3. Align the two thumbscrews on the I/O module with the screw holes on the rear of the shelf.
4. Tighten the thumbscrews.

Rack Mounting a Disk Shelf

To ensure correct functionality of the rack mounted shelf the guidelines set out in Chapter 2 regarding environmental, mechanical and electrical recommendations must be followed.

NOTE: When installing or removing a rack mount shelf, you must remove all power supplies and disk drives. You must work with at least one other person. This is necessary to prevent personal injury and damage to the shelf.

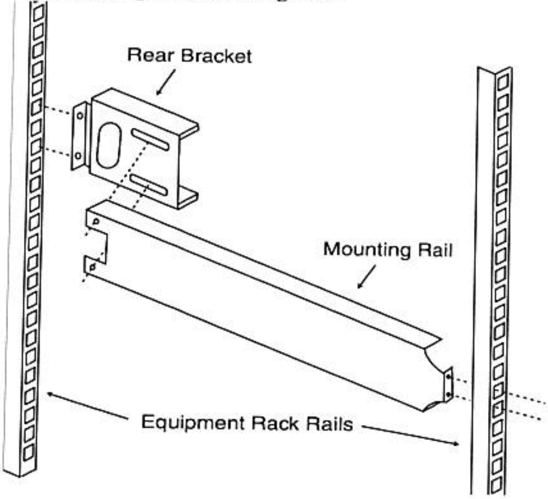
There are two parts to rackmounting a XL500 Ultra2 SCSI Storage Array in an equipment rack. Firstly the mounting rails have to be installed and then the shelf can be installed on the mounting rails.

Installing the Mounting Rails (see Figure 5-3)

1. Attach the rear bracket to the mounting rail using the two fixing bolts provided but do not tighten the bolts. This allows for adjustment to fit your equipment rack.
2. Using the fixing screws provided attach the rear bracket to the rear rails of your equipment rack.
3. Using the fixing screws provided attach the mounting rail to the front rail of your equipment rack.
4. Tighten the bolts joining the rear bracket to the mounting rail (from step 1).
5. Repeat this procedure for the opposite side.

The mounting rails are now in place and the XL500 Ultra2 SCSI Storage Array can be mounted in the equipment rack as described below.

Figure 5-3. Installing the mounting rails



Removing a Shelf from an Equipment Rack

1. Shut down the host system and turn off the power.
2. Turn off the disk shelf power switch and disconnect the shelf power cords.
3. Disconnect all cables from the rear of the shelf.
4. Remove the four mounting screw from the front of the disk shelf.
5. Slide the disk shelf out of the equipment rack rails.

Installing a Shelf in an Equipment Rack

1. Install the mounting rails as described above.
2. Onto the mounting rails install the XL500 Ultra2 SCSI Storage Array and secure in place using the four mounting screws provided.
3. Tighten the screws.

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Appendix A: Technical Specifications

GENERAL	
Host Bus Interface	Ultra 2 Low Voltage Differential, Ultra 1 Single Ended, Ultra 1
Number of Host Interfaces	1
Maximum Drives per Shelf	7
Disks Supported	3.5" LVD, 3.5" Ultra S/E, SCSI 2 Fast/Wide
Maximum Capacity Per Storage Shelf[1]	126 GB (using 7 x 18GB drives)
Drive Interface	LVD
Redundant and Hot Swappable Power Supply Units (PSU's)	Yes. Removable from the front
Redundant and Hot Swappable Advanced Cooling Modules (ACM's)	Yes. Removable from the rear
Backplane	Passive LVD

[1] This figure will increase to 252GB if 7 x 36GB disk drives are used.

MONITORING	
Temperature Monitoring	Yes[1]
Fan Monitoring	Yes[1]
Fan Speed Control	Yes
Power Supply Monitoring	Yes[1]
Disk Drive Monitoring	Yes[1]
Failure Notification	Audible Alarm, LED, Optional Software Reporting, In-Band Reporting[1]

[1] Requires optional Versatile Environmental Monitor (VEM)

ELECTRICAL and ENVIRONMENTAL	
Input Voltage Range	85V to 132V ***and*** 187V to 264V
Frequency Range	47Hz to 63Hz
Operating Temperature	5°C to 40°C
Operating Humidity	5% to 95% (with a gradient of 10%or less per hour)
Regulatory Approvals	CE, FCC Class A, CSA, UL 1950.
Warranty	3 years

PHYSICAL	Max No. of Drives	Dimensions mm (inches)
Single Tower	7 per shelf	408x499x161 (16x20x6)
19" Rackmount	7 per shelf	358x459x131 (14x18x5)

Approved Disk Drives	
Disk-0972L-A1	9GB LP 7200RPM Ultra 1/2 drive in carrier
Disk-1872L-A1	18GB 7200RPM Ultra 1/2 drive in carrier
Disk-0910L-A1	9GB 10,000RPM Ultra 1/2 drive in carrier
Disk-1810L-A1	18GB 10,000RPM Ultra 1/2 drive in carrier

Appendix B: Power Supply Pin Assignments

Autoranging 260W Power Supply Unit

The Autoranging 260W Power Supply Unit connector is of the type DIN41612H15 series and the DC output pin assignment is shown in the table below:

Pin			**Pin**		
1	Z4	0V	9	Z20	5V_OK
2	D6	12V	10	D22	AC_OK OR 48V_OK
3	Z8	12V	11	Z24	0 Volts Logic or PS_ON
4	D10	0V	12	D26	No Connect
5	Z12	0V	13	Z28	Neutral
6	D14	+5V	14	D30	Live
7	Z16	+5V	15	Z32	Chassis Ground (Leading Pin)
8	D18	12V_OK			

260W DC Power Supply Unit

The 260W DC Power Supply Unit connector is of the type DIN41612415 series and the DC output pin assignment is shown in the table below:

Pin			Pin		
1	Z4	0V	9	Z20	5V_OK
2	D6	12V	10	D22	INPUT_OK
3	Z8	12V	11	Z24	0 Volts Logic
4	D10	0V	12	D26	No Connect
5	Z12	0V	13	Z28	0V or -48V Input
6	D14	+5V	14	D30	48V or 0V Input
7	Z16	+5V	15	Z32	Chassis GND
8	D18	12V_OK			

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